

Digital Twin of the Edgar Experimental Mine

A Colorado School of Mines and Deloitte student research partnership, powered by OptoAI

Company Background

Deloitte (and [SFL Scientific, a Deloitte company](#)) have deployed OptoAI, a physical AI platform that combines commercial drones with bespoke AI models for real-time, autonomous detection. Deloitte is partnering with Colorado School of Mines to explore multi-phase AI applications and solutions for mining and beyond; this project is phase I.

Description of the Work

A student team will build the software to turn sensor data captured in the Edgar Experimental Mine into a high-fidelity 3D map and navigable digital twin using Mines equipment. The map and dataset are intended for open release to the Mines community, with Deloitte credited as sponsor, so the result is a lasting, widely used resource.

Phase I work is organized into three connected workstreams, delivered in sprints:

- 3D mapping and digital twin — build data pipelines to ingest RGB-D and LiDAR scans, register scans into a georeferenced 3D point cloud and mesh, and prepare the model as a navigable digital twin in OptoAI.
- Defect and crack detection — label and manage imagery of rock walls and structures, train a computer vision model to flag cracks and anomalies, and overlay detections onto the 3D map with severity.
- Visualization and review — build a web viewer to explore the twin and findings, add alerts and a human-in-the-loop review workflow, and package the open dataset with documentation.

Core deliverable: a georeferenced 3D digital twin of Edgar with a web viewer. Stretch goals (crack detection model and alerting dashboard) will be scoped to fit the semester.

Desired Skill Set

Students are expected to learn new tools as part of the course, yet prior experience in all areas below is not required but helpful:

- Python / C++ for data pipelines and processing
- Computer vision / ML for defect detection models
- 3D geometry and point clouds — SLAM, meshing, registration
- Web / UI development for the twin viewer and dashboard
- Git and agile workflows for sprint-based collaboration

Preferred Team Size

3 to 4 students

Location

Work will be performed primarily on campus or remotely, with occasional on-site visits to the Edgar Experimental Mine or Deloitte. Mileage for on-site visits will be covered per Field Session guidelines.

Non-Disclosure Agreement

NDA required.

Intellectual Property

Mines retain ownership of student work and all artifacts produced. Deliverables are intended for open release to the Mines community, with Deloitte credited as sponsor.

Fall 2026 Sprint Timeline

- Aug 24 – early Sep: Kickoff and requirements
- Sprints 1–2 (Sep): Capture and pipeline
- Sprints 3–4 (Oct): 3D digital twin
- Sprints 5–6 (Nov): Detection and viewer
- Dec: Delivery and final presentation